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A . Report Title: NATO CCMS PILOT STUDY ENVIRONMENTAL ASPECTS OF REUSING FORMER MILITARY LANDS

B. DATE Report Downloaded From the Internet MAY 1997

C. Report's Point of Contact: (Name, Organization, Address, Office Symbol, & Ph #

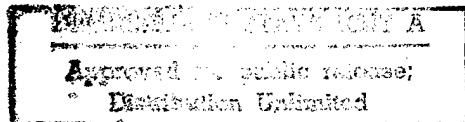
NAVAL FACILITIES ENGINEERING COMMAND
Alexandria va 22332-2300

D. Currently Applicable Classification Level: Unclassified

E. Distribution Statement A: Approved for Public Release

F. The foregoing information was compiled and provided by:
DTIC-OCA, Initials: __JC__ **Preparation Date:** 02 Sept 1998

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DTIC QUALITY INSPECTED 1

AQI 98-12-2119

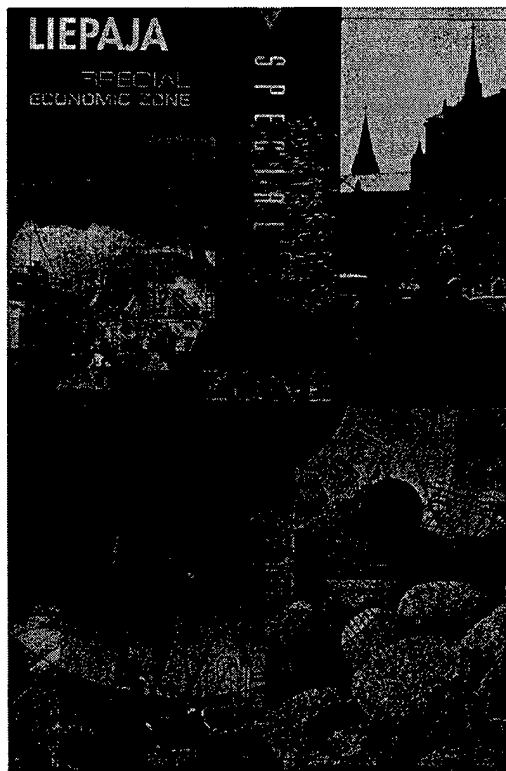


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NATO CCMS Pilot Study: Environmental Aspects of Reusing Former Military Lands

**Liepaja, Latvia Special Economic Zone
Phase II Site Visit and Proposal Evaluation**



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May 1997

In late January 1997 the Office of the Under Secretary of Defense (Acquisition and Technology) formally requested participation from each of the services in support of a NATO pilot study entitled the Environmental Aspects of Reusing Former Military Lands by the Committee on the Challenges of Modern Society [NATO/CCMS] (OUSD 1997). The Office of the Deputy Assistant Secretary of the Navy (Environment and Safety) in cooperation with Chief of Naval Operations (N45) directed the Naval Facilities Engineering Command (Environmental Programs Division) to select a technical representative to serve on an international delegation focused on environmental cleanup, reuse and economic revitalization of former military lands in Eastern Europe. The Navy's primary purpose for participating in this NATO/CCMS mission to Europe was to share non-classified information on innovative environmental cleanup technology and strategies for reducing costs associated with closed or closing military installations.

From approximately 31 March through 16 April 1997, Mr. Todd Margrave, environmental engineer (NAVFAC Code 41TM), accompanied members of an international team comprised of German, Canadian and American delegates and visited former Soviet military installations in Estonia, Latvia, Czech Republic and Poland. Mr. Margrave was selected as team leader for the Liepaja, Latvia Special Economic Zone project because of prior environmental restoration and base closure experience at U.S. Naval bases with similar site conditions. This report presents findings, observations and opinions gathered by Mr. Margrave and the international team. Views expressed in this report are solely those of the NATO/CCMS delegation and do not represent official Department of the Navy or Department of Defense positions.

Site Background and Physical Setting

Liepaja is located on the western coast of Latvia approximately 200 km southwest of Riga. With a population of 97,000 inhabitants, Liepaja is the third largest city in Latvia (City Council of Liepaja 1997a). The NATO/CCMS delegation was tasked with assessing the Liepaja Special Economic Zone (SEZ), an area called Karosta encompassing the northern third of Liepaja and the outlying harbor regions (Figure 1). Also known as the "secret city", Karosta served as the second largest Soviet naval base of its kind in the Baltic next to St. Petersburg (City Council of Liepaja 1997b).

The existing Harbor is comprised of outer breakwaters, an outer harbor basin protected by another set of breakwaters, and two channels with quays. The southernmost channel, the City Channel, connects the Baltic Sea with Liepaja lake. The Tosmares Channel to the north connects the former Karosta Military facility with the sea. The berthing areas within the inner harbor appeared satisfactorily protected even though the existing breakwaters protecting the outer basin are in need of repair due to ongoing wave impact. The southern part of the breakwater has more or less collapsed, causing suspended sand to overtop the breakwater and settle in the outer harbor basin (COWI-Baltec 1996).

Whereas a harbor has been in existence in Liepaja for many hundreds of years, most of the surviving Karosta construction dates back to early military development by Russian Czar Alexander III beginning in the 1890's. A canal, ship repair base, two dry docks, shore gun emplacements, roads, railways, troop housing, mansions for nobility, and two Orthodox cathedrals were built in the years leading up to World War I. Some 35 construction projects were implemented each year starting in 1892. Most of the man-made structures located in the 7.6 square mile area are attributed to this early period (City of Liepaja 1997b).

After a brief occupation by Nazi Germany from 1941-45, Soviet Forces resumed control of Karosta for the next 49 years. Little is publicly known about the post World War II occupation years except that a multitude of defense related activities involving Liepaja Harbor and surrounding lands were conducted up to Soviet withdrawal in 1994. NATO/CCMS observers noted dry-dock and ship repair facilities, submarine berths, torpedo and missile repair shops, numerous fuel storage and transfer points, munitions storage bunkers, remnants of an extensive surface-to-air missile base, a battery reclamation and storage yard, and dozens of industrial buildings of uncertain use. Liepaja officials report that Karosta contains 498 buildings including 209 apartment buildings (City Council of Liepaja 1997a).

Initial Impressions

The NATO/CCMS team spent several hours touring Karosta facilities including, what appeared to be, former missile and torpedo repair shops, a major ship repair unit, an air defense missile base, a submarine base with support facilities, two large fuel depots, several scrap and salvage yards, dozens of ordnance bunkers, and a battery storage and reclamation area. The Tosmares Channel (including North Basin and Docking Basin) with numerous sunken or partially sunken warships and submarines was also observed from many vantage points.

After the inspection, members of the international delegation discussed the overall condition of Karosta and Liepaja Harbor and agreed that most facilities and supporting infrastructure were, at best, in fair condition based on Western European and North American standards. With no observed caretaker process or security systems in place most former military fixed assets including buildings, docks, roads, railways, communication networks, and public utilities were rapidly degrading and in various stages of disrepair. Natural processes combined with local salvaging operations have severely damaged dozens of historically significant and fully functional buildings, as well as miles of roads and communications systems. Local officials have reportedly appeased locals by allowing unabated scavenging of building and recyclable materials such as lumber, brick, copper wire, glass, tile, and fencing.

Due to limited funding from all sources, only vital assets appeared to be receiving any upkeep. Liepaja officials explained that 401 buildings including 42 apartment

buildings have no immediate use or would require extensive renovation and repair prior to reuse. It is unfortunate for Liepaja that much of the existing infrastructure was focused on specialized military activities not inherently suitable for rapid conversion and economic redevelopment.

Environmental Conditions

The legacy of environmental degradation forced upon Karosta and Liepaja Harbor was obvious to all NATO/CCMS delegates. More than a hundred years of heavy industrial and municipal pollution have left behind scores of observed and suspected areas of environmental concern. With no formal site characterization information except a Liepaja Harbor sediments study conducted by COWI-Baltec (1996) the true nature and extent of soil and groundwater contamination in Karosta could only be speculated by team members. Enough observed evidence existed to conclude that substantial environmental restoration of both Liepaja Harbor and the surrounding Karosta lands will eventually be required.

The extent of observed environmental and ecological degradation is typical of former military installations in Eastern Europe according to delegates from the German National Country Team. Latvian officials and the NATO/CCMS team agreed that the major areas of concern include:

- Two petroleum tank farms where substantial hydrocarbon spills and leakage are known to have occurred (Figures 2-5).
- Ship, torpedo and missile repair shops where solvents, fuels, and heavy metals were commonly used (Figures 6 & 7).
- The former submarine battery reclamation and storage area where lead and other heavy metals have been detected in nearby Liepaja Harbor sediments (Figures 8 & 9).
- Two dry-docks where heavy metals from sandblasting residues are expected (Figure 10).
- Air defense missile firing locations where propellant spills are suspected (Figure 11).
- An extensive array of former ammunition and explosives warehouses, bunkers and other holding structures which may contain explosive materials and debris (Figures 12 & 13).
- Miscellaneous sites throughout the Karosta and Liepaja Harbor, particularly near industrial shops, fuel storage and transfer facilities, railroad lines, scrap yards, and piers suggesting the presence of petroleum hydrocarbons, solvents and heavy metals (Figures 14-17).

Certain areas of the Karosta, most notably the submarine battery reclamation area on the northern bank of the Naval Harbor Canal, the tank farms on either side of the Docking Basin, and much of the industrial complex on the east side of North Basin will require extensive remediation prior to reuse. Numerous areas adjacent to or near underground storage tank facilities are also suspect pending specific future use. Areas

used to store ordnance, particularly in the northern region of Karosta, are likely to be contaminated with unexploded ordnance (UXO), explosive materials, and hazardous debris.

Fortunately, many areas within Karosta appeared to be free of observed or suspected environmental problems. Aside from deteriorating infrastructure, large areas of military housing and certain industrial areas appear suitable for immediate reuse. It should be noted that the NATO/CCMS team did not spend much time in areas without known or suspected environmental concerns. Therefor, a preliminary site assessment including testing for lead and asbestos contamination in these areas was suggested to Liepaja officials.

Though not part of the Liepaja SEZ Phase II NATO/CCMS proposal, water quality and sediment condition in Tosmares and City Channels was briefly reviewed by the team. The COWI-Baltec (1996) study made available to the international delegation described significant heavy metal and hydrocarbon contamination in Liepaja Harbor. According to the report, high levels of all analyzed contaminants were detected in the inner part of the Tosmares Channel. Polyaromatic hydrocarbons (benzo(a)pyrene), total petroleum hydrocarbons (TPH) and selected heavy metals (cadmium, chromium, copper, mercury, lead, nickel and zinc) were present in samples. Samples from sediments in the outer part of the Tosmares Channel, in the City Channel and in the Winter Harbor were also significantly contaminated. In outer harbor samples, contaminant levels were predominantly lower.

Not surprisingly, the COWI-Baltec (1996) study observed a high, specific lead contamination in the middle part of the Tosmares Channel, which was attributed to the former battery storage and reclamation area on the northern side of the channel. It appears that the release of heavy metals including lead from sediments, especially those from the highly contaminated Tosmares Channel, has been minimal due to chemical speciation of metals caused by strong anaerobic conditions found in the harbor.

With the exception of the COWI-Baltec (1996) report, the NATO/CCMS team was not able to collect or ascertain enough supportable evidence to comment on specific environmental issues such as source control, risk to human health, and the true nature and extent of contamination. As previously stated, the team observed enough direct evidence to conclude that environmental degradation of both Liepaja Harbor and the surrounding Karosta lands has occurred necessitating basic site characterization prior to implementing proposed reuse.

Economic Issues

All members of the NATO/CCMS delegation agreed that Liepaja was still suffering from Soviet withdrawal and in search of a new economic base. According to information provided by Liepaja officials, population has declined steadily from 115,000 in 1991 to approximately 97,000 in 1997. The official unemployment rate was 7.7

percent at the end of 1996, down from 8.2 percent at the beginning of the year. Most of the unemployed were industrial specialists, service and trade employees, and accountants sharply focused on supporting the Soviet military machine. Official numbers did not appear to account for a large number of dislocated Russian nationals inhabiting the abandoned sections of Karosta (City of Liepaja 1997b). Liepaja officials suggested that many were older pensioners and former Soviet military servicemen and their families. The new Latvian government requires that Latvian be spoken in order to receive citizenship. Many spoke only Russian and were, subsequently still unable to receive full public assistance.

Fortunately, other economic indicators were more positive. Inflation in Liepaja has been drastically reduced from a high of 959 percent in 1992 to just over 13 percent in 1996. Similarly, Liepaja has benefited from a strong Latvian currency (Lat) and an excellent credit rating from the international banking community. Cargo handling at the Port of Liepaja including timber, metal, dry goods, and containerized products has steadily increased from approximately 107,000 tons in 1992 to over 1,600,000 tons in 1996. Demand for Liepaja Port facilities is expected to grow steadily as neighboring Eastern Europe countries emerge from economic restructuring and begin trade with Western Europe and the Americas. In particular, Russia, now without its Baltic ports, has a growing need for ice-free shipping facilities (Ibid).

Liepaja SEZ Proposal Evaluation

The formal proposal submitted to Mr. Gary Vest in the Office of the Under Secretary of Defense (Acquisition and Technology) and Mr. Fritz Holzwart in the Office of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety on September 24, 1996 was reviewed by members of the international team during the Liepaja site visit (OUSD 1997). The proposal contains basic site background information, a rough estimate of ecological damage, a preliminary remediation plan, thoughts on appropriate cleanup standards, a cursory economic analysis, some concerns about quality assurance, a section on technology selection, a partial bibliography and several site maps. The proposal is understandably vague due to a general lack of site characterization data, but is clear in its attempt to link environmental cleanup with viable economic development.

Several issues addressed in the proposal are key to Latvian desire to participate in Phase II of the NATO/CCMS Pilot Study. First, the local Liepaja government appears willing but financially unable to commence non-revenue producing environmental site assessment and cleanup activities. A weak local economy and associated tax base combined with limited Latvian central government funding have created a shortage of start-up environmental capital. Reportedly, foreign investors are not inclined to invest in economic redevelopment of Liepaja without specific information on environmental site conditions. This makes sense given the strong likelihood of becoming a potentially responsible party in a foreign country with uncertain laws and penalties regarding environmental liability and non-compliance.

The need to stimulate economic redevelopment and subsequently create jobs for Latvians is the main force behind the proposals clear prioritization of site assessment and remedial activities. A prioritized list for Karosta lands is described in the proposal. Sites listed in order of importance are:

1. Tank farm and similar fuels storage, transfer and processing areas identified as uncontrolled point sources likely causing unacceptable risk to human health and the environment.
2. All other known or suspected, uncontrolled point sources of fuel, solvent or other chemical pollution likely causing unacceptable risk to human health and the environment.
3. Any controlled point sources of fuel, solvent or other chemical pollution likely causing unacceptable risk to human health and the environment.
4. Non-specific sources of fuel, solvent or other chemical pollution affecting ecological or historically significant locations but not human health.

In all cases, future land use must be considered. Regions of the Karosta with immediate revenue producing potential were the focus of the team's guided tour. This explains why the proposal places a greater emphasis on cleaning up tank farm and fuel storage areas than on cleaning up sediments in the Tosmares and City Channels. Remedy selection and specific technology implementation will be contingent upon the nature and extent of pollution discovered, the pace of economic development, and the availability and funds.

With few, if any, cleanup standards, the proposal indirectly implies that certain uncontrolled, high risk sites with no economic value may not get cleaned up due to lack of funds. In order to avoid this condition, Latvian officials propose to use existing international environmental cleanup standards until national legislation can be enacted. The standards from Europe, Canada and the United States are the most likely adoption candidates. Liepaja officials seemed very committed to protecting the public, particularly when site assessment activities reveal obvious and imminent danger to human health and the environment.

Finally, the proposal requests that the bulk of environmental site assessment and restoration work be carried out by existing Latvian companies. According to Liepaja City officials, several environmental cleanup companies have registered with the government and are waiting for opportunities to participate in economic redevelopment. As in the United States, there are great expectations for generating jobs from environmental cleanup and technology development.

In addition to the formal proposal, numerous supporting documents were made available to the NATO/CCMS delegation. The most significant documents being the *Law on the Liepaja Special Economic Zone* (Republic of Latvia 1997), the *Law on Ports* (Republic of Latvia), and the *Review of Liepaja Environmental Condition* (Republic of Latvia 1996). The first two documents provide the legal basis for the Liepaja SEZ and

Port related activities. The later provides a basic overview of environmental conditions in the greater Liepaja vicinity. None of the documents specifically addresses environmental cleanup laws and regulations, but all appear to be necessary references for prospective foreign investors when negotiating with Latvian officials.

Recommendations

Overall, the proposal presents a good first draft of key Latvian concerns regarding cleanup and future use of former Soviet military facilities in Karosta and Liepaja Harbor. Inadequate site characterization data, limited cleanup money, uncertain reuse plans, and nonspecific foreign investment, make the proposal understandably vague. A few suggestions for strengthening the proposal include:

- Add an abstract or executive summary to the beginning that clearly and succinctly states purpose, financial requirements, time frame and key decision makers (no more than one page).
- State purpose of Latvian participation in Phase II such as desire to secure funding, gain site assessment assistance, learn about innovative technology, etc. (one paragraph)
- Discuss, specifically any Latvian resources available to the project such as access to officials, assistance in establishing cleanup standards, economic incentives, etc. (one paragraph)
- Develop a ballpark estimate for site assessment and actual cleanup costs of specific areas of concern, and include basic rationale for assumptions. (one page)
- Simplify the economic section by eliminating the question and answer format and, focusing on what information is known and readily available. (one page)

In addition to solidifying the Phase II proposal, the NATO/CCMS team encourages the Latvian government to aggressively pursue basic site characterization of Karosta and Liepaja Harbor. Until specifics about the nature and extent of environmental contamination are answered, reuse planning and economic recovery will be hindered. NATO member Nations possess valuable technical, financial and managerial resources that would be useful to Latvia.

The United States Navy, for example, within its Naval Facilities Engineering Command (NAVFAC) maintains unique technical expertise in the areas of expedited site characterization of closing Naval bases. The following resources are potentially available for Latvian environmental restoration efforts:

- The Site Characterization and Analysis Penetrometer System (SCAPS) is a proven technology for rapidly evaluating the nature and extent of petroleum hydrocarbon

contamination. SCAPS could quickly assess many of the tank farm areas for a fraction of the cost of conventional sampling techniques.

- The Field Sampling and Analyses Technologies Matrix and Reference Guide will be available in the Fall of 1997. Jointly developed by NAVFAC and the United States Environmental Protection Agency, the site screening matrix will provide a cost-efficient means of selecting innovative and conventional site characterization technology.
- Specialized technical expertise available through in-house NAVFAC organizations such as the Alternative Restoration Technology Team (ARTT) and the Tiger Team. The first group focuses on locating, demonstrating and implementing innovative environmental technology and cost saving management techniques. The latter combines the resources of the Naval Facilities Engineering Service Center (NFESC) and select private sector consultants/academia for the purpose of optimizing existing and future environmental restoration projects.

Conclusion

Overall, the proposal presents a good first draft of key Latvian concerns regarding cleanup and future use of former Soviet military facilities in Liepaja, Latvia. The primary mission of the international delegation was to review the Phase II NATO/CCMS Pilot Study proposal and observe site conditions firsthand. The proposal clearly states Latvia's need to link environmental restoration with sound economic redevelopment. Foreign investors are expected to participate in site assessment and actual cleanup of Karosta and Liepaja Harbor in exchange for a piece of Latvia's future prosperity. A list of environmental priorities clearly defines the need for immediate site assessment and remediation of uncontrolled chemical releases to the environment. A thorough site investigation of critical revenue producing parcels should be undertaken as soon as possible. United States Navy SCAPS equipment, site screening guide and practical field experience would assist Latvian efforts to quickly and economically characterize the nature and extent of pollution within the Liepaja SEZ.

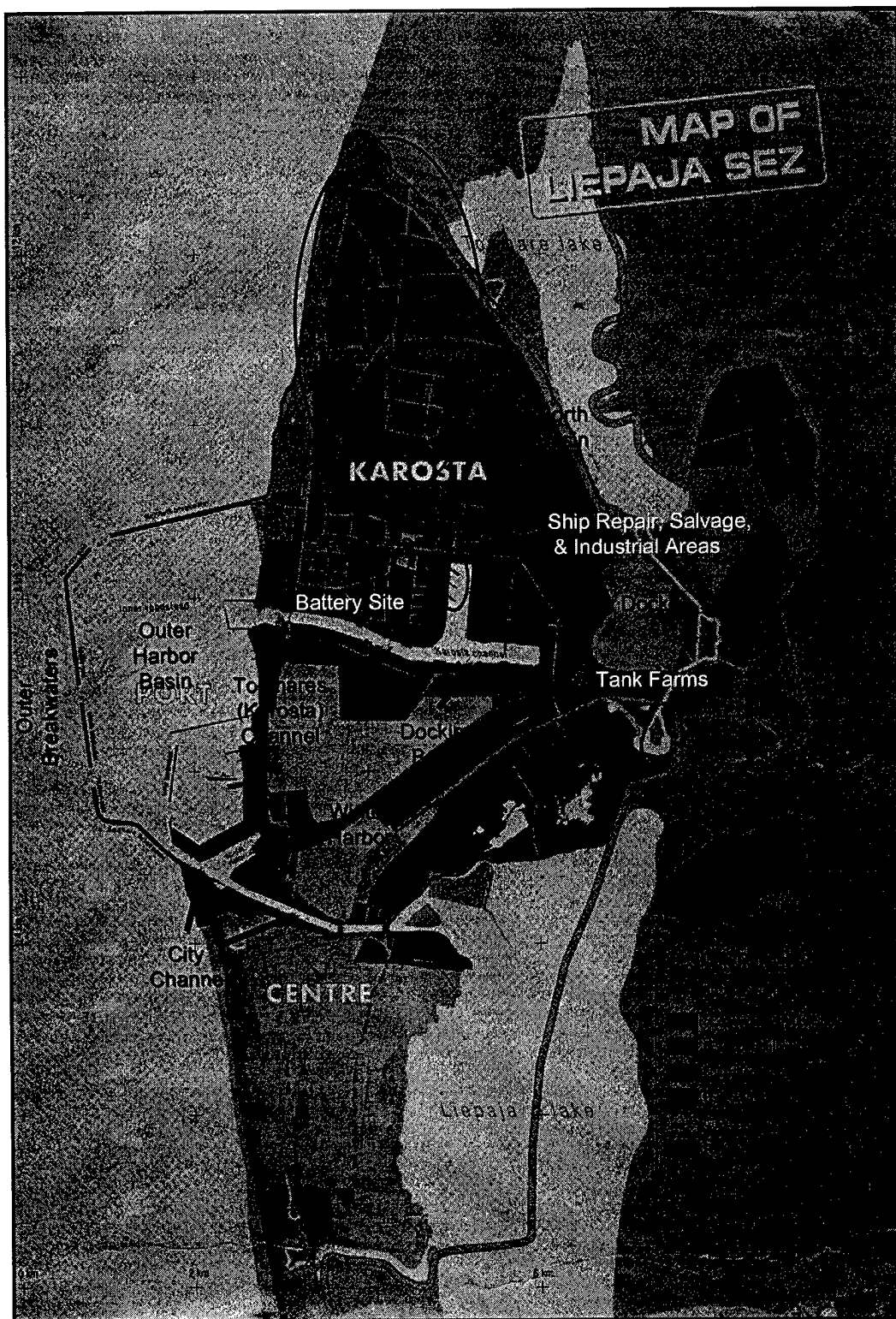


Figure 1 - Liepaja, Latvia Special Economic Zone (SEZ) and Areas of Environmental Concern

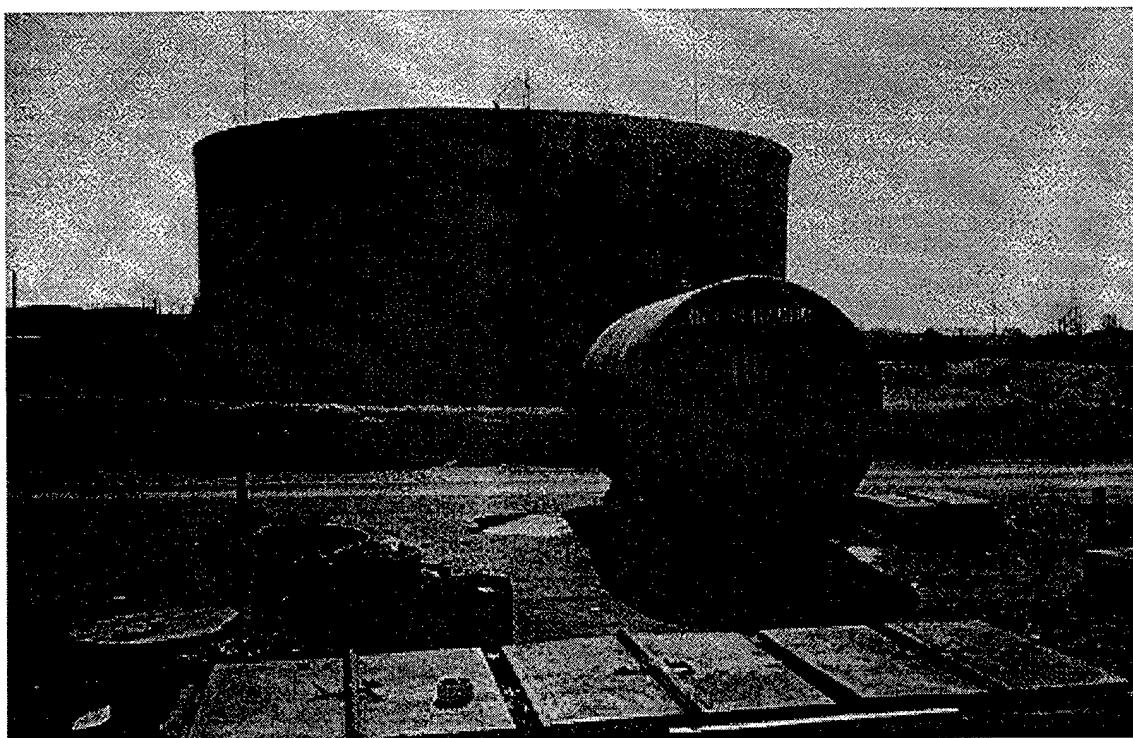


Figure 2 - "Older" Above Ground Storage of Fuel in Tank Farm Area

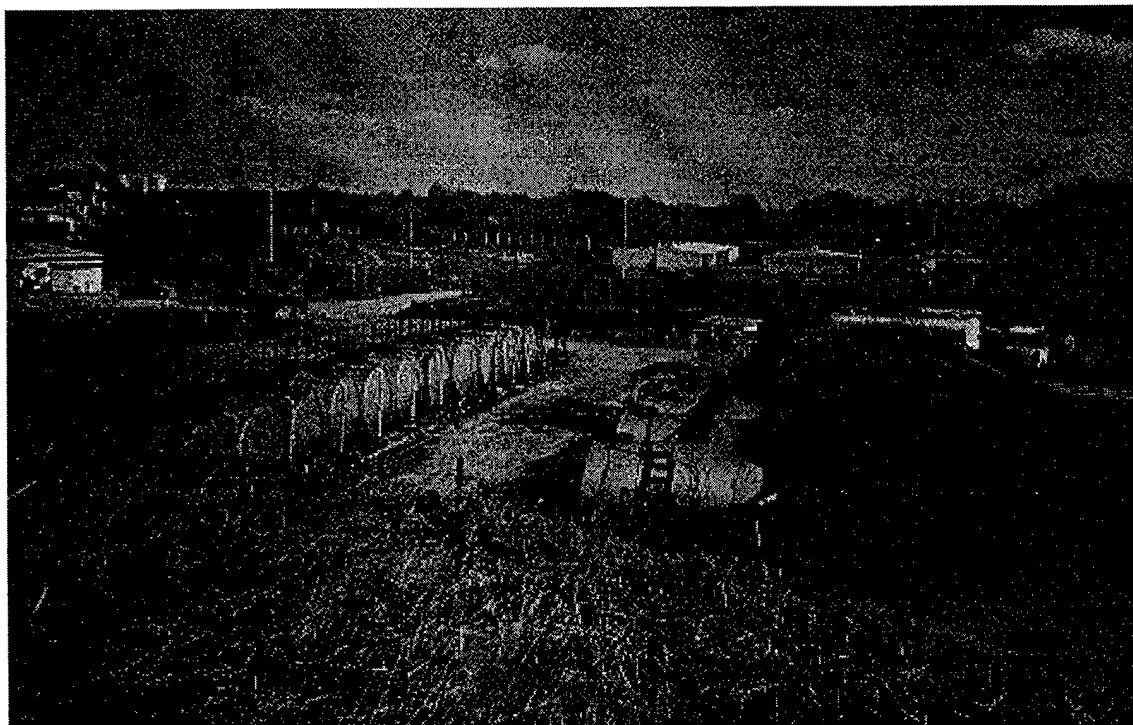


Figure 3 - "Newer" Above Ground Fuel Storage in Tank Farm Area

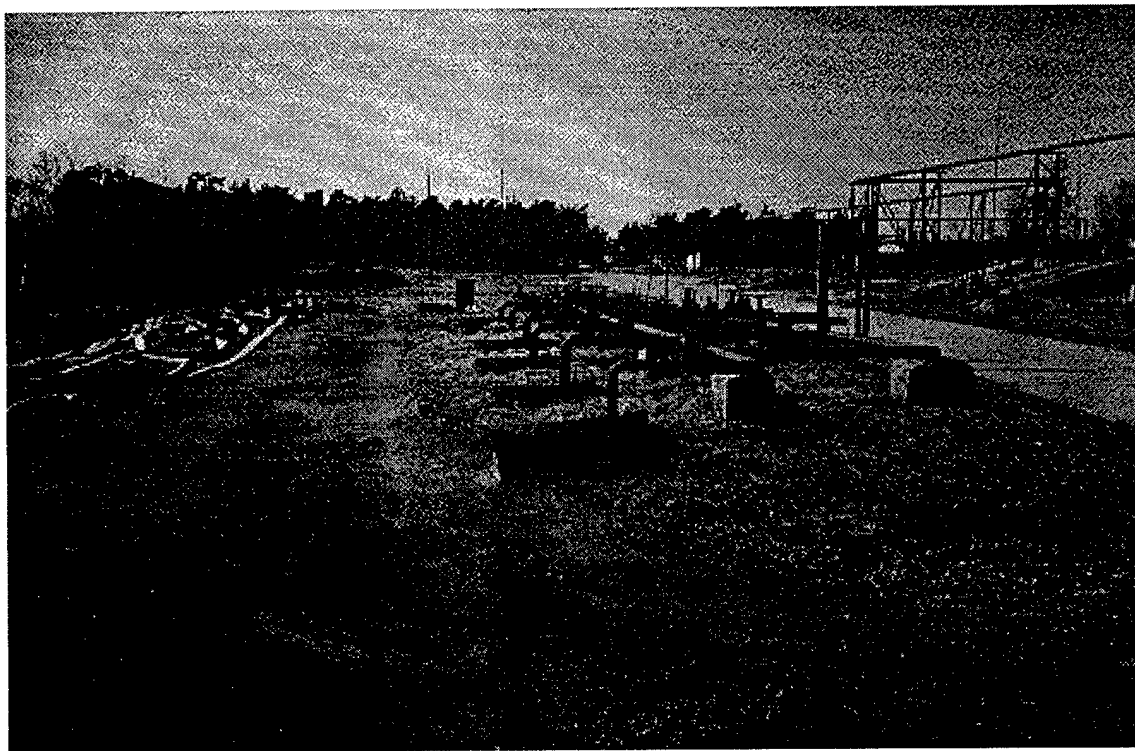


Figure 4 - Former Underground Fuel Storage and Transfer Facility in Tank Farm Area

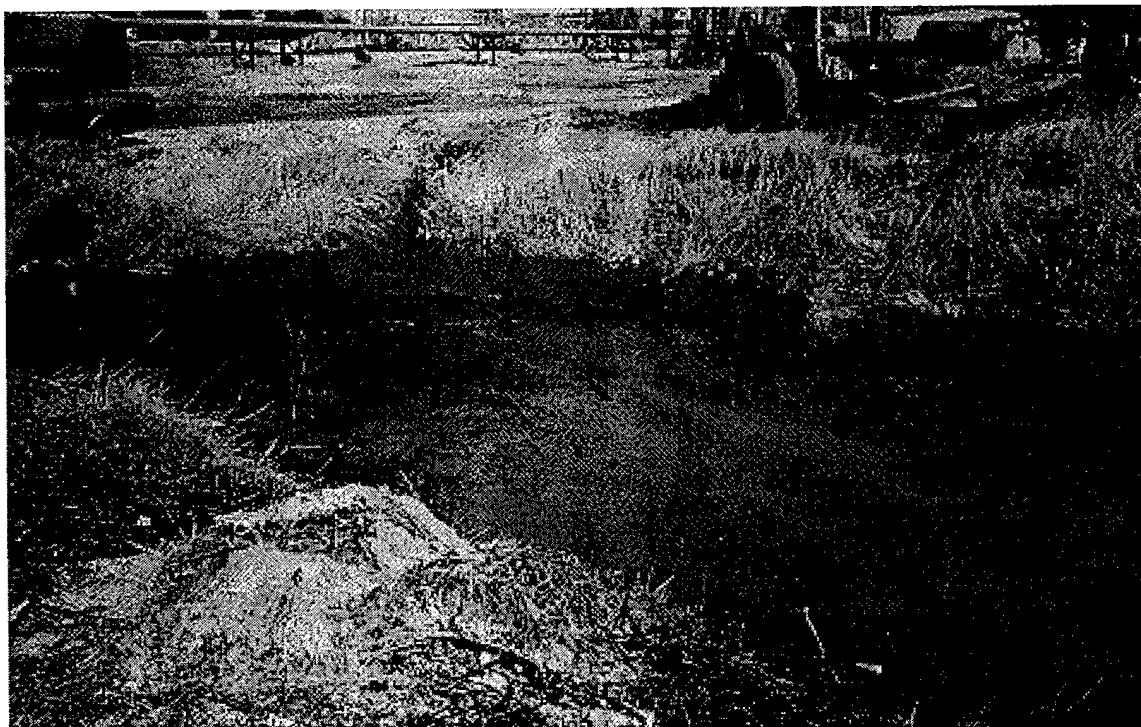


Figure 5 - Fuel Overflow and Waste Dumping Pit in Tank Farm Area

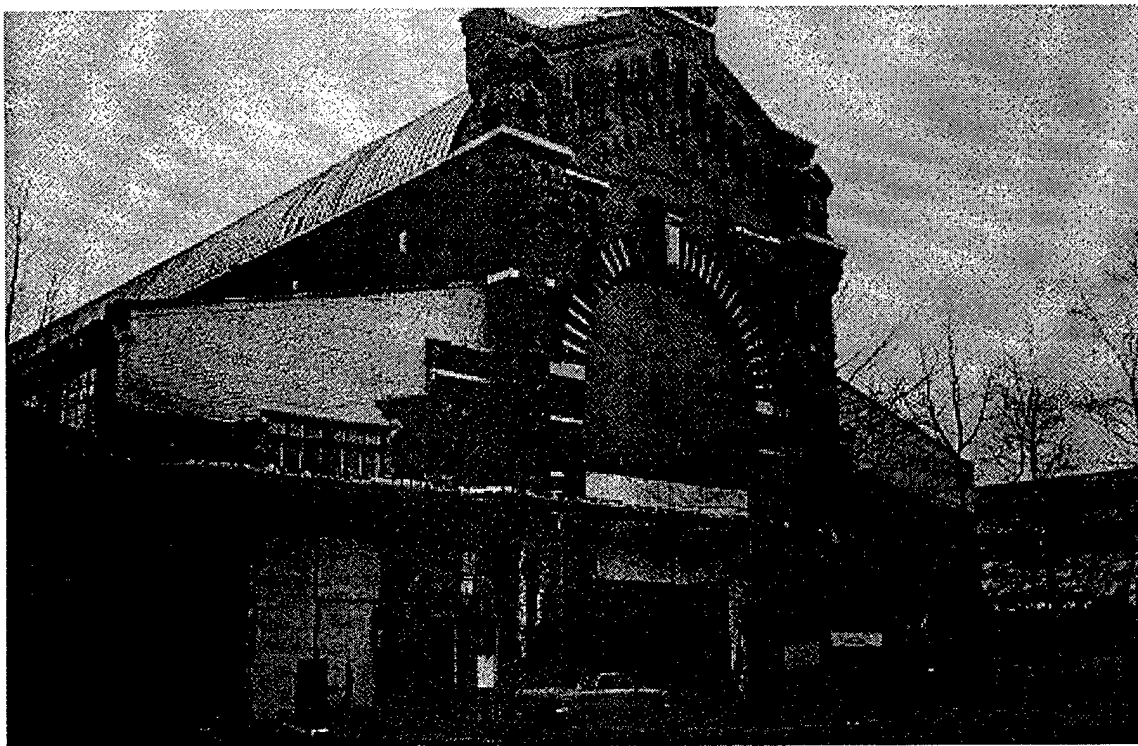


Figure 6 - Machine Shop and Ship Repair Facility



Figure 7 - Torpedo and Missile Repair Facilities

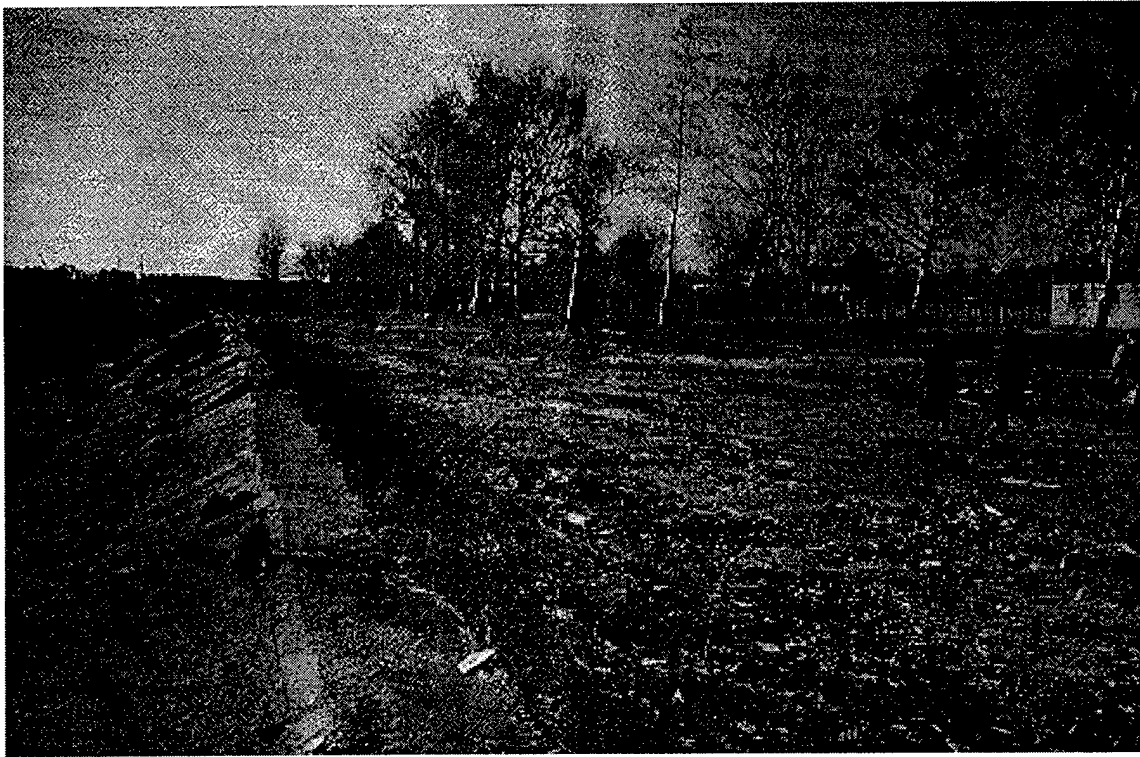


Figure 8 - Lead-acid Battery Storage and Reclamation Area



Figure 9 - Lead-acid Battery Casings in Tosmares Channel

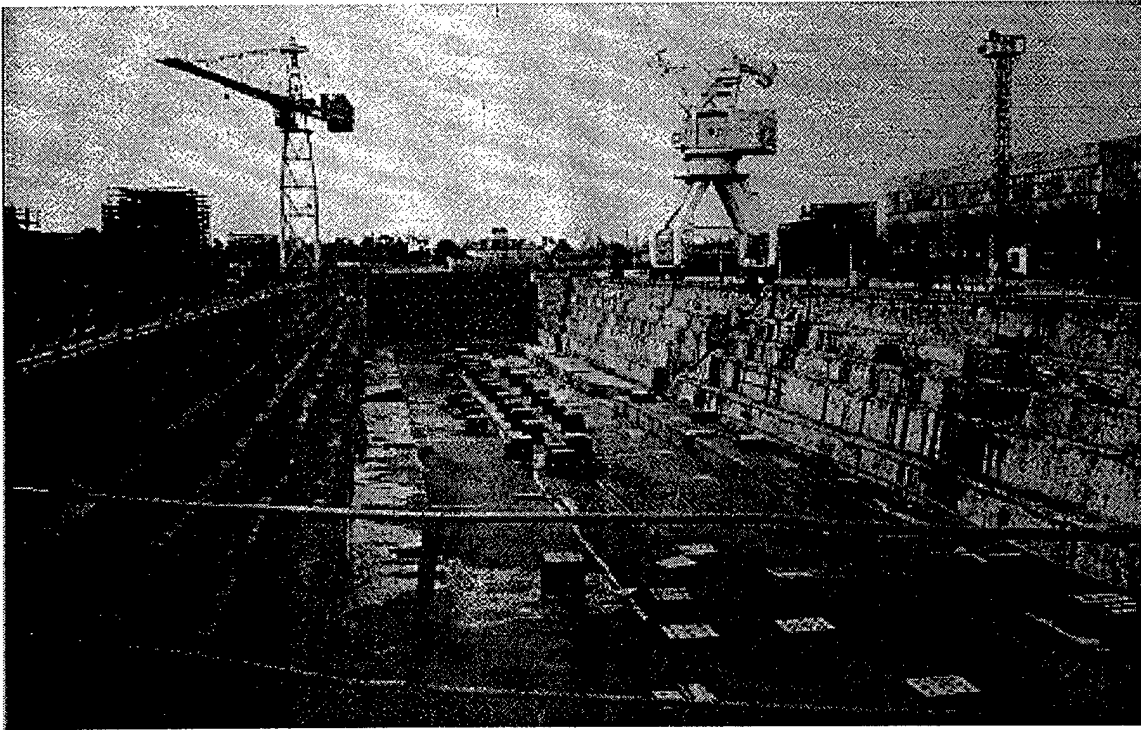


Figure 10 - One of Two Working Dry-dock Facilities

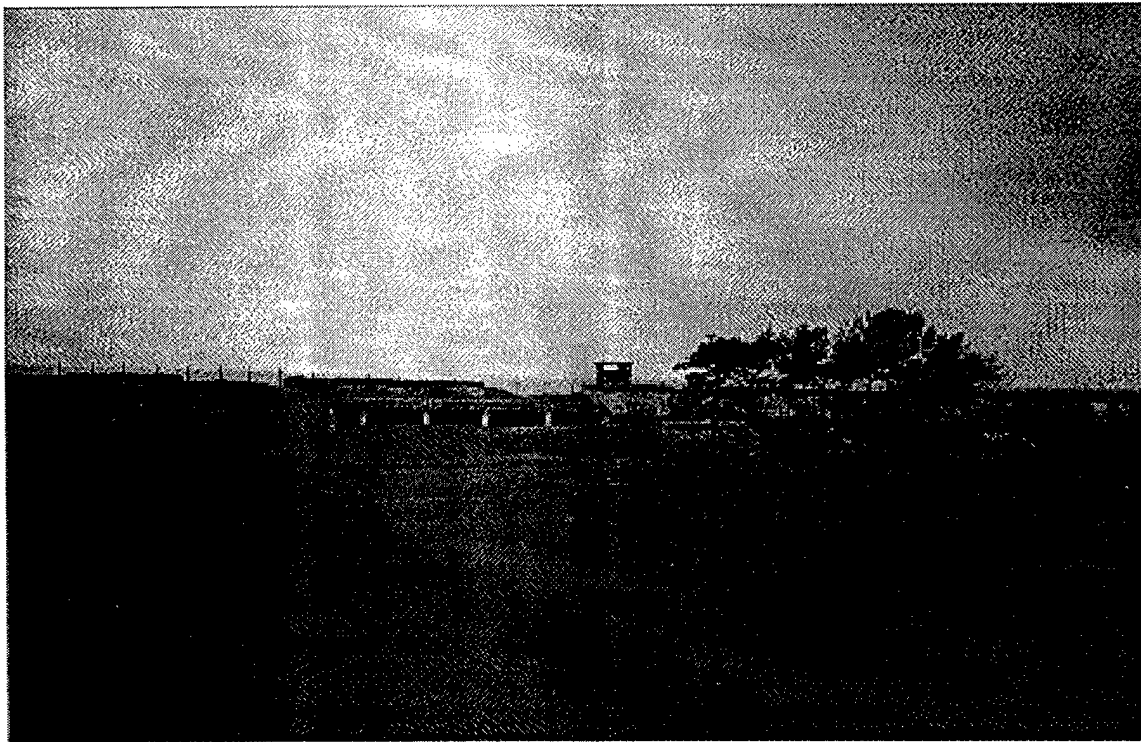


Figure 11 - Propellant Spill Site in Former Air Defense Base



Figure 12 - Missile Storage Bunker in Northern Karosta



Figure 13 - Fire Suppression Water Storage Pond and Suspected Ordnance Dump



Figure 14 - Typical Stained Site in Industrial Area



Figure 15 - Industrial Area Scrap Yard

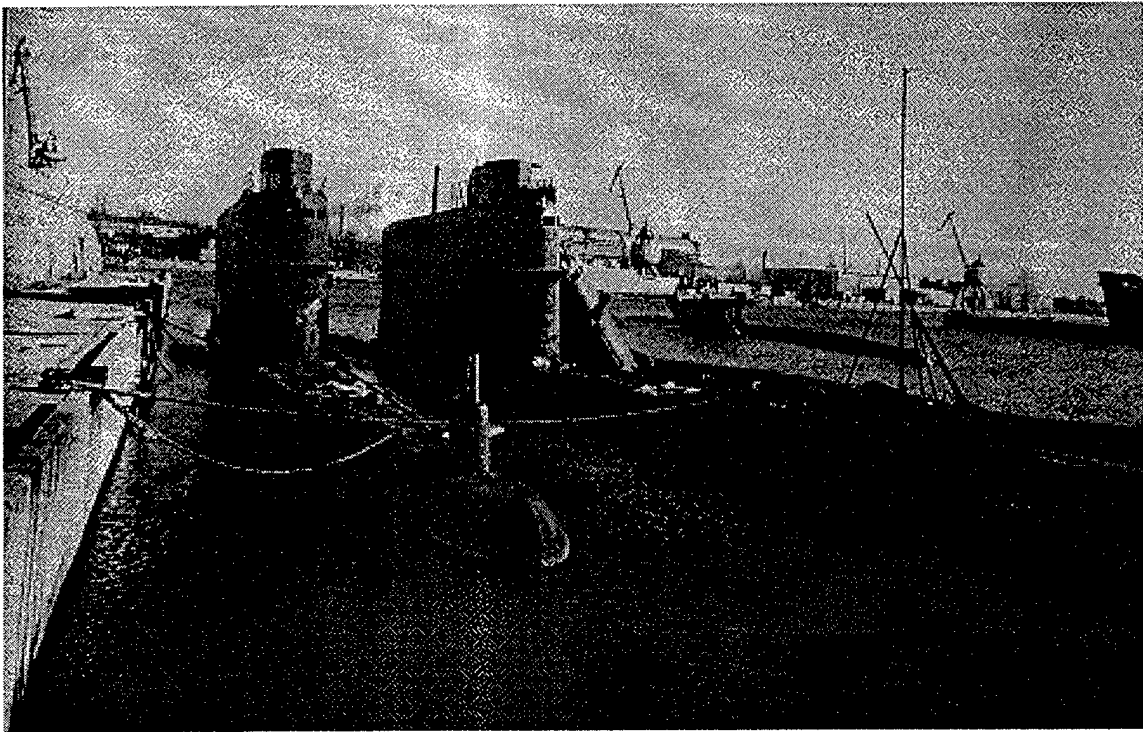


Figure 16 - Scuttled Vessels Waiting for Salvage in Submarine Pier Area

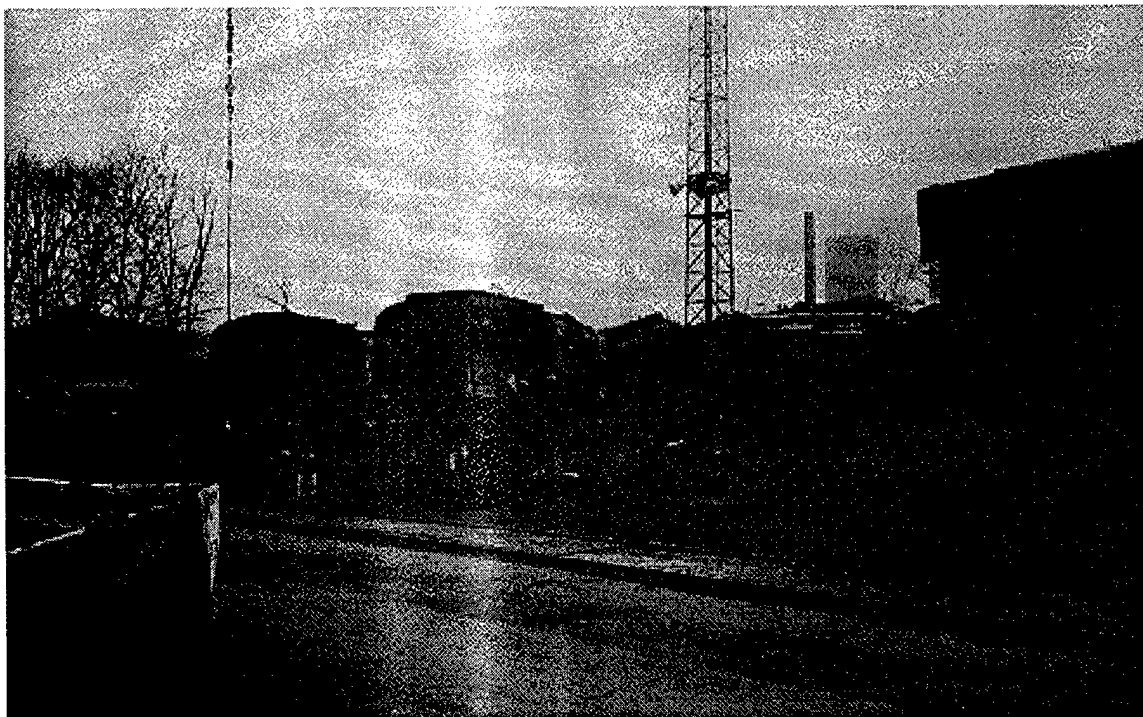


Figure 17 - Rail Transportation Salvage Yard

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